Space Weather Forecast

Issued on Friday, 30 December 2022 at 13:18 Local

This forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

Space Weather Forecast Headline: Chance of G1/Minor Geomagnetic Storms mainly day 1 (30th), Chance of further Moderate X-ray flares throughout.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Moderate solar activity with one Moderate X-ray flare observed from a new sunspot region on the northeast limb. This is likely to reveal more complexity as it rotates onto the disc, and is also accompanied with a further small spot to the south, that may from part of the same complex. Other spots of interest include a large region in the northeast that has seen some magnetic complexity develop around its main large spot, and a smaller region in the northwest that has been developing fairly rapidly in the last 24 hours. A sunspot region in the southeast has also seen some development of small spots. The other four regions, to give nine total on the disc, have remained small and simple. No Earth-directed coronal mass ejections (CMEs) have been observed.

Solar Wind / Geomagnetic Activity: Solar winds suggest a mixture of a transition into the fast wind of a coronal hole perhaps enhanced further by the glancing effect of a passing CME which left the Sun on the 25th. Initially slightly elevated speeds of around 420-450km/s, increased from 23/2100 UTC to be variable at 450-550 km/s. Total strength of the magnetic field was initially weak before rising to Moderate briefly at 29/2200 UTC, and more persistently from 30/0100 UTC. The north-south component, was largely negative (southward) with brief oscillations into positive (northward) but with increasing strength in either direction, peaking at Moderate levels. Geomagnetic activity was Quiet to Active with one G1/Minor Storm interval observed at 30/0000-0300 UTC.

Energetic Particles / Solar Radiation: The count rate of energetic particles (high energy protons) was at background with no solar radiation storms occurring.

Four-Day Space Weather Forecast Summary

Solar Activity: Low to Moderate activity is expected, with an ongoing daily chance of Moderate X-ray flares. There is a slight chance of Strong class flares occurring.

Solar Wind / Geomagnetic Activity: There are no Earth-directed CMEs, however ongoing fast winds from a coronal hole may also include some influence from a potential CME enhancement that was forecast to pass close to the Earth on the 29th. This left the Sun on the 25th. These fast winds are expected to persist day 1 and 2 (30th and 31st) with elevated winds of around 550-600 km/s only gradually subsiding to slightly elevated day 3 and 4 (1st and 2nd), and no further enhancement are expected. Geomagnetic activity is forecast to be initially Unsettled to Active, with a chance of G1/Minor Storm intervals, before gradually easing to be Quiet to Unsettled, with a chance of Active period by day 3 (1st) and mainly Quiet with isolated Unsettled intervals by day 4 (2nd).

Energetic Particles / Solar Radiation: The count rate of energetic particles (high energy protons) is forecast to remain at background with no solar radiation storms occurring. However there is a slight chance of these rising in response to any larger flares that may occur, and

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perhaps exceeding the S1/Minor Radiation storm level.

Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	Yes	50	30	5	1
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	Yes	55	55	50	40
Very Active	R3 to R5 X	No	5	5	5	5

Solar Radiation Storms - (High Energy Protons):

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ S1	No	5	5	5	5
Very Active	≥ S3 *	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

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